



Commentary

Menstrual TSS remains a dangerous threat

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I provide commentary for an important epidemiology study by Billon et al.[1] who address recent risk factors of menstrual toxic shock syndrome (mTSS). mTSS came to the attention of the biomedical community dramatically in the early 1980s, through both publications [2–4] and impressive news media attention. Mathematical modeling, based on percent of women lacking protective antibodies [5], percent of women with TSS Toxin-producing *Staphylococcus aureus* vaginally [6], and amount of TSS Toxin required for sufficient vaginal transport [7], predicted the maximum incidence of mTSS should be near 10/100,000 (10/100K). This was indeed the case.

The prior studies showed the risk of mTSS was higher in young women who used tampons than in women who used menstrual pads [2–4]. Risk increased along with increased tampon absorbency [4]. In 1984, the last of the highest absorbency tampons were removed from the market as a result of convincing epidemiology, and particularly, a mTSS lawsuit (O'Gilvie v. International Playtex), with accompanying greatly reduced, yet still present, risk of mTSS [8,9]. Regulatory standards were established worldwide resulting in uniform labeling of tampon absorbency and inclusion of package inserts. Women were advised they could reduce, but not eliminate, their likelihood of developing mTSS by not using tampons, using them intermittently, or if choosing to use tampons, using the lowest absorbency to control menstrual flow. With the above regulations and advice, the incidence of mTSS dropped to 1-2/100K.

The last epidemiology study of mTSS was performed in 2011, where we reported the incidence was 1.4/100K in 13–24 year-aged young women. In the United States, this would be approximately 1000 cases per year [9]. There was also a background incidence of TSS that occurred independent of tampon use, combining both males and females, at approximately 0.5/100K [9].

The current Billon et al.[1] research is the only new epidemiology study of mTSS performed since 2011. Their findings confirm the mTSS association with tampon use and case numbers being 1-2/100K young women in France, meeting the clinical criteria for mTSS or probable mTSS.

Several unique and potentially alarming findings were determined in the Billon et al.[1] study. There has not been pervasive news media coverage of mTSS since the incidence was reduced 10-fold in 1984. This has led to complacency, confirmed by the Billon et al.[1] study, which found that young women were more likely to develop mTSS if they were unfamiliar with warning information. There should always be strong warning mechanisms in place to keep young women abreast of mTSS as they near menstruation. This must be more than simply providing tampon box warnings and package inserts. Every young woman should know that mTSS has early flu-like symptoms near or during menstruation, including acute onset of fever, vomiting and diarrhea, and progressive dizziness upon standing. If present, they should seek immediate medical attention. This could be done by periodic broad mass media attention.

The most potentially controversial aspect of the study by Billon et al.[1] is their finding that use of tampons for >6 h or overnight use increases risk of mTSS. A prior study showed an increased risk of mTSS in association with overnight use of tampons [3]. However, that prior study was performed in the early 1980s when tampons of the highest absorbency were marketed. Since 1984, there has been little evidence to suggest that tampon use of >6 h or even overnight (approximately 8 h) poses an increased risk on mTSS. This has led to the current recommended use of a tampon for 2–8 h. The Billon et al. [1] finding is important if confirmed by additional recent epidemiology data. It is important to consider that 8-h tampon use overnight versus 8-h use during the daytime may also have different risks due to different body positions and menses accumulation. If the current data are confirmed, the recommended duration of use of individual tampons should be reduced. No matter what, however, women should remain vigilant to the early mTSS symptoms, and they should use enhanced caution with tampon use of >6 h.

Finally, the manuscript finds the median age of mTSS cases to be 18 years in France. This is higher than in the United States wherein most cases occur in young women 12–15 years of age. It is unknown why this difference exists, but it could be that young women in the United States begin menstruation and/or use of tampons at earlier ages.

The Billon et al.[1] study is important in that it emphasizes concerns that mTSS is less-recognized today among young women, putting them at elevated risk. Prolonged use of tampons appears to increase risk. mTSS remains a dangerous infection.

Declaration of Competing Interest

None

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.eclinm.2020.100316](https://doi.org/10.1016/j.eclinm.2020.100316).

Reference

- [1] Billion A, Gustin M-P, Tristan A, Benet T, Berthiller J, Gustave C A, Vanhems P, Lina G. Association of Characteristics of Tampon Use With Menstrual Toxic Shock Syndrome in France, EClinicalMedicine. <https://doi.org/10.1016/j.eclinm.2020.100308>.
- [2] Davis JP, Chesney PJ, Wand PJ, LaVenture M. Toxic-shock syndrome: epidemiologic features, recurrence, risk factors, and prevention. N Engl J Med 1980;303:1429–35.
- [3] Shands KN, Schmid GP, Dan BB, et al. Toxic-shock syndrome in menstruating women: association with tampon use and *Staphylococcus aureus* and clinical features in 52 cases. N Engl J Med 1980;303:1436–42.
- [4] Osterholm MT, Davis JP, Gibson RW, et al. Tri-state toxic-state syndrome study. I. Epidemiologic findings. J Infect Dis 1982;145:431–40.
- [5] Parsonnet J, Hansmann MA, Delaney ML, et al. Prevalence of toxic shock syndrome toxin 1-producing *Staphylococcus aureus* and the presence of antibodies to this superantigen in menstruating women. J Clin Microbiol 2005;43:4628–34.
- [6] Schlievert PM, Shands KN, Dan BB, Schmid GP, Nishimura RD. Identification and characterization of an exotoxin from *Staphylococcus aureus* associated with toxic-shock syndrome. J Infect Dis 1981;143:509–16.
- [7] Schlievert PM, Nemeth KA, Davis CC, Peterson ML, Jones BE. *Staphylococcus aureus* exotoxins are present in vivo in tampons. Clin Vaccine Immunol 2010;17:722–7.
- [8] Hajjeh RA, Reingold A, Weil A, Shutt K, Schuchat A, Perkins BA. Toxic shock syndrome in the United States: surveillance update, 1979–1996. Emerg Infect Dis 1999;5:807–10.
- [9] DeVries AS, Leshner L, Schlievert PM, et al. Staphylococcal toxic shock syndrome 2000–2006: epidemiology, clinical features, and molecular characteristics. PLoS One 2011;6:e22997.